

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
10 May 2001 (10.05.2001)

PCT

(10) International Publication Number  
**WO 01/33511 A3**

(51) International Patent Classification<sup>7</sup>: G06T 17/00, A61F 2/02

(21) International Application Number: PCT/US00/41821

(22) International Filing Date:  
3 November 2000 (03.11.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/163,323 3 November 1999 (03.11.1999) US

(71) Applicant (for all designated States except US): CASE  
WESTERN RESERVE UNIVERSITY [US/US]; 10900  
Euclid Avenue, Cleveland, OH 44106 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): DEAN, H., David  
[US/US]; 19801 Malvern Road, Shaker Heights, OH  
44122 (US).

(74) Agent: MINNICH, Richard, J.; Fay, Sharpe, Fagan, Min-  
nich & McKee, LLP, 7th floor, 1100 Superior Avenue,  
Cleveland, OH 44114-2518 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ,  
DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,  
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,  
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,  
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,  
TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,  
IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF,  
CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

(88) Date of publication of the international search report:  
20 December 2001

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

WO 01/33511 A3

(54) Title: SYSTEM AND METHOD FOR PRODUCING A THREE-DIMENSIONAL MODEL

(57) Abstract: A shape of a medical device to be implanted into a subject is verified by acquiring a plurality of inter-fiduciary marker dimensions from the subject. Three-dimensional image data of the markers and a tissue of interest, included in the subject, is obtained. Respective measurements between the fiduciary markers around the subject and in the image data are confirmed. The tissue of interest and the fiduciary markers are identified in the image data. Points of the tissue of interest and the fiduciary markers are rendered as a 3-dimensional surface representation. A 3-dimensional model of the tissue of interest and the fiduciary markers is generated as a function of the surface representation. A shape of the medical device to be implanted into the subject is determined as a function of the 3-dimensional model.

## INTERNATIONAL SEARCH REPORT

National Application No  
PCT/US 00/41821

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G06T17/00 A61F2/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06T A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ZACHOW S ET AL: "Optimized arrangement of osseointegrated implants: a surgical planning system for the fixation of facial prostheses" PROCEEDINGS OF 13TH INTERNATIONAL SYMPOSIUM ON COMPUTER ASSISTED RADIOLOGY AND SURGERY (CARS'99), PARIS, FRANCE, 23-26 JUNE 1999, pages 942-946, XP001011404 1999, Amsterdam, Netherlands, Elsevier Science, Netherlands ISBN: 0-444-50290-4 sections 3, 3.1-3.3	1-4,6,7, 10, 13-15,17
A	---	5,8,9, 11,12,19
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*Z\* document member of the same patent family

Date of the actual completion of the international search

3 July 2001

Date of mailing of the international search report

13/07/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl.  
Fax: (+31-70) 340-3016

Authorized officer

Kröner, S

## INTERNATIONAL SEARCH REPORT

I. International Application No  
PCT/US 00/41821

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NOORDMANS H J ET AL: "Localisation of subdural EEG electrode bundles in an interactive volume rendering framework" MEDICAL IMAGE COMPUTING AND COMPUTER-ASSISTED INTERVENTION - MICCAI'99. SECOND INTERNATIONAL CONFERENCE. PROCEEDINGS (LECTURE NOTES IN COMPUTER SCIENCE VOL.1679), CAMBRIDGE, UK, 19 - 22 September 1999, pages 734-741, XP001011391 1999, Berlin, Germany, Springer-Verlag, Germany ISBN: 3-540-66503-X	1-4,6,8
A	abstract  sections 1, 1.1, 2	10,11, 13-15,17
X	WELLS W ET AL: "VIDEO REGISTRATION USING FIDUCIALS FOR SURGICAL ENHANCED REALITY" PROCEEDINGS OF THE ANNUAL INTERNATIONAL CONFERENCE OF THE ENGINEERING IN MEDICINE AND BIOLOGY SOCIETY,US,NEW YORK, IEEE, vol. CONF. 15, 28 October 1993 (1993-10-28), pages 24-25, XP000431483	1-3
Y		10,13, 14,17
A	the whole document	4-9,11, 12,15, 16,18-20
Y	GB 2 324 470 A (CUSTOMFLEX LIMITED) 28 October 1998 (1998-10-28) page 1, line 1 -page 2, line 14	10,13, 14,17

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/US 00/41821

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2324470    A	28-10-1998	NONE	